

The Echinoderms Newsletter¹

No. 5. January 1974

Prepared in the Department of Invertebrate Zoology (Echinoderms), National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560 U.S.A.

Another year has suddenly disappeared. Again, we're late. And again, we find that some of the information contained in this Newsletter is out-of-date.

This issue, No. 5, represents some sort of anniversary, and we wonder where we should go from here, as far as the Newsletter itself is concerned. It seems evident that the Newsletter is useful to at least some of you, because we have received numerous enquiries concerning the whereabouts of this issue. As long as there is a continuing demand, we would be delighted to continue producing the Newsletter. We are somewhat concerned about its content; is there some way in which we can better serve echinoderm research? What should be added or subtracted? Should arguments/discussions concerning some important topics (classification of major taxa; phylogeny; conservation of echinoderms; "standard techniques"; etc.) be aired in these pages? Please let us have your views, and we'll circulate them.

With the advent of the computer age (recently observed sweeping through the hallowed halls of the Smithsonian Institution), we are now in a position to have our address labels produced by some automatic method, thereby saving a vast amount of time and trouble. We intend to distribute a revised Directory of Echinoderm Specialists with the next Newsletter. If your address has changed (or differs in some details from the address on your present mailing label), please let us know by completing the form which comprises the last page of this Newsletter, and returning it to us. We hope to have the new Directory ready by around April, 1974.

Happy New Year!

David L. Pawson
Maureen E. Downey

¹The Echinoderms Newsletter is not intended to be part of the scientific literature, and should not be cited, abstracted, or reprinted as a published document.

Zoological Record:

Ailsa M. Clark writes "Thanks to everyone who sent me separates of their papers during my stint as Zoological Recorder for Echinoderms, now completed with the 1970 number. This work will be continued by the permanent staff of the Zoological Record (address: c/o British Museum (Natural History), Cromwell Road, London SW7, England) who work mainly from publications in the libraries. However, I'm sure they would appreciate receiving copies of any papers in obscure periodicals or such as might be subject to delay in reaching the British Museum Libraries". We should offer a great vote of thanks to Ailsa Clark for devoting so much of her time and energy to the Echinoderms section of the Zoological Record for so many years.- It will be extremely difficult for future compilers to meet the high standards she has set.

"THE PERIPROCT" - Alan BAKER and Helen CLARK are now producing an informal bulletin (The Periproct) of interest to echinoderm specialists whose research interests lie in the South Pacific. It is intended to be a rapid means of circulating echinoderm news and other information around the South Pacific area. Interested? Please contact Dr. Baker or Dr. Clark.

Survey of British echinoderms:

The Marine Biological Association of the U.K. and the Biological Records Center have begun a survey of British Echinoderms. Its main aim is to collect accurate information from which maps of distribution of echinoderm species can be drawn, and to add to knowledge of habits and habitats of each species. The survey will include those species known from depths of less than 200 meters, and a key to the 82 known species has already been prepared. The area covered includes the entire continental shelf to the north and west of the British Isles, the English Channel and the North Sea.

While there is much already published information that can be used, additional information on distribution and ecology from researchers working with echinoderms or other marine animals, and amateur naturalists, particularly divers, is especially valuable. The Echinoderm Survey would welcome records from both professional and amateur biologists. Please write Dr. Eve C. Southward, (Echinoderm Survey), The Laboratory, Citadel Hill, Plymouth PL1 2PB, England for further information.

Workshop in X-Ray biocrystallography:

From June 10-21, 1974, a workshop in X-Ray biocrystallography will be held at McGill University. The course will be given by Dr. Gabrielle Donnay, Professor of Crystallography, Department of Geological Sciences, McGill University, Station "A", P.O. Box 6070, Montreal, Quebec, Canada H3C 3G1. It will consist of an introduction to the theory and experimental methods of X-Ray crystallography, using single crystal techniques and powder methods. It should be useful to zoologists and paleontologists who have an interest in the nature of exo- and endo-skeletons. Cost of the course is \$250.00. Rooms in student residences are available at \$50.00 per week, including all meals. Applications are due by 15 April 1974. Please write Dr. Donnay for further details.

CRAB WITH UMBRELLA

Bob Foster writes "A group of geologists from Shell's Rijswijk, Holland, laboratory were studying recent carbonate sediments in the Persian Gulf from the motor vessel Tylos. One of the geologists, Gene Shinn, found a small crab carrying a living Echinodiscus auritus on its back.

I saw it when he brought it back to Doha, Qatar. The crab had a carapace about 4 cm broad by 2 cm long. The two rear pairs of legs were rather small and terminated in small hooks. The legs faced upward and it looked as though they could not have been turned around to touch the ground. The front two pairs of legs appeared normal, and there were two small equal sized claws.

When found, the crab was carrying a 9 cm by 9 cm Echinodiscus right side up. When the echinoid was taken off, the crab would pick up again by wriggling underneath it. The crab held the echinoid by its edges, or more often just put the hooks into the spines. When the echinoid was taken away, the crab picked up a nearby shell.

Gene took a short movie of the crab doing its act with the echinoid. If anyone is interested, his current address is:

Mr. E. A. Shinn
Public Affairs Department
Shell Oil Company
15th Floor
1 Shell Plaza
Houston, Texas 77001 U.S.A.

Acanthaster symposium:

L. ELDREDGE has supplied the following information: A symposium "Biology and ecology of the crown-of-thorns starfish, Acanthaster planci (L)" was held in Guam during May 1973 at the Pacific Science Association Second Inter-Congress. Fifteen papers have been brought together into a special symposium issue of the journal Micronesica (Volume 9, number 2, December, 1973). Single copies of the volume are available for \$4.00 (postpaid) each from:

Micronesica
University of Guam
P.O. Box EK
Agana
Guam 96910 U.S.A.

International Symposium on Indo-Pacific Tropical Reef Biology:

This symposium will be held on the Islands of Guam and Palau, Mariana and Caroline Islands Groups from June 23 - July 5, 1974, and will be followed by optional field excursions to Sulu Archipelago-Philippines and East Malaysia-Hong Kong. The symposium was arranged to determine the current status of knowledge of various groups of coral reef organisms, to discuss methods of closing gaps in our knowledge, and to discuss possible future programs of research. Group fare and accommodation programs are available. For further information, if seriously interested, please contact:

Western Society of Naturalists
David H. Montgomery, Secretary
Department of Biological Sciences
California Polytechnic State University
San Luis Obispo, California 93407, U.S.A.

Requests, For Sale, Suggestions, Etc.

A. BELL - would like to know if anyone has observed bioluminescence in Axiognathus (formerly Amphipholis) squamatus.

DOWNEY - would like to have specimens of any species of the asteroid genus Hymenaster for anatomical studies; would like to add them to collections of the U. S. National Museum.

KIER - wants to see Triassic echinoids from anywhere in the world.

MARKEL - wishes to have lanterns of echinothuriid echinoids for study.

SERAFY - has duplicates of many echinoderm papers, and would like to exchange them for papers which he does not have.

STRATHMANN - would like information on frequency of spawning of individual echinoderms, and length of pelagic life for echinoderms when both are known or can be guessed for a species.

TURNER - would like information on methods of gamete release in hermaphroditic holothurians; also information on methods of juvenile release in coelomic or ovarian brooding holothuroids.

Current Research Interests

- ARNAUD - ecology and adaptive biological peculiarities among antarctic and subantarctic echinoderms (necrophagy, brood protection, growth); pelecypod commensals of antarctic echinoderms.
- ATWOOD - ultrastructure of reproductive systems of holothurians.
- AUNG - biology and ecology of the sand dollar Arachnoides placenta (L.), including larval behavior.
- BELL (A.) - ultrastructure of Amphipholis squamata and Acrocnida brachiata.
- BELL (B.) - edrioasteroid respiration; description of new Cambrian edrioasteroids (with SPRINKLE); description of a Lower Devonian edrioasteroid population; function of thecal shape in a Mississippian population of edrioasteroids.
- BINYON - water and salt movements in asteroids.
- BLAKE - reproduction in two population of Ophiopholis aculeata from the northwest Atlantic.
- BOCKELIE - cystoids from Norway and Sweden (Ordovician); skeletal morphology of cystoids; stratigraphical studies of crinoid stems from Ordovician and Silurian in Norway.
- BRAY - distribution and ecology of shallow water ophiuroids of Barbados; species diversity, habitat complexity and resource utilization.
- CAREY - Arctic benthic ecology - Western Beaufort Sea sublittoral and bathyal communities; ecology and radioecology of bathyal and abyssal benthos in the northeast Pacific.
- CLARK - echinoderms of South Africa; systematics of recent stalked crinoids.
- COADY - reproductive biology of Cucumaria frondosa and Psolus fabricii (Holothuroidea) in shallow waters of the Avalon Peninsula, Newfoundland.
- DAMBACH - color change of sea urchins; behavior of sea urchins.
- DEVANEY - systematics of new Marshall and Hawaii islands ophiuroids; studies on ophiocomid brittlestars. 2. The genus Ophiomastix.
- ELLINGTON - intracellular isosmotic regulation in hyper- and hyposmotically stressed Luidia clathrata, including role of free amino acids as osmotic effectors.

- LE MENN - Paleozoic crinoids of Brittany.
- LUCAS - effects of environmental parameters on larvae of Acanthaster planci.
- MARKEL - functional anatomy of sea urchin teeth; growth of echinoderm skeleton; morphology of sea urchin teeth.
- MASSIN - histology, histochemistry and fine structure of digestive tract, respiratory trees, Cuvierian tubules of holothurians.
- MENGE - role of biological and physical factors in community structure and species diversity in rocky intertidal of New England; competition between two subtidal starfish (Asterias vulgaris and A. forbesi) in Massachusetts Bay.
- MILEIKOVSKY - speed of active movement of pelagic larvae of marine bottom invertebrates; their ability to regulate vertical position summary of larval development of marine bottom invertebrates on a world-wide basis; distribution of pelagic larvae in world oceans.
- MILLENDORF - Eleutheroocrinus (Blastoidea) growth study: statistical analysis.
- MITROVIC - Mesozoic Echinoidea.
- NIESEN - reproduction and ecotypic variation in Dendraster excentricus; population and reproductive biology of Leptasterias hexactis.
- OGURO - holothurian morphology; development of sea-stars.
- PASTOR - ecology of echinoderms and mollusks of Majorca.
- PAWSON - Indian Ocean holothurians; Ascension Island echinoderms.
- PERPEET - pollution studies - histological and histochemical modifications induced by pollution by heavy metals (Asteroidea - mainly water-vascular system).
- PROKOP - Family Synbathocrinidae Miller (Crinoidea) from the Devonian of Bohemia; Ichthyocrinus bohemicus (Crinoidea) n. sp. from the Lower Devonian of Bohemia.
- RAO (K.V.) - faunas inhabiting echinoderms.
- REGIS - systematics, ecology, population dynamics of Mediterranean echinoids.
- ROMAN - relationships between Paleogene echinoid faunas of America and Europe.

- EMERSON - ultrastructural studies on development and regeneration of ocelli in the asteroid Leptasterias polaris.
- FELL (F.J.) - shallow water (less than 600 meters) echinoids of the Antarctic Peninsula; growth and regeneration of the echinoid test.
- FERGUSON - starfish nutrition: physiological adjustments in correlation with seasonal environmental changes.
- FOSTER - Australian and New Zealand Tertiary holasterid echinoids.
- GONOR - mechanisms of entrainment of reproductive cycles to environmental factors in marine invertebrates (including echinoids and holothurians).
- HAMADA - self-reassembly of echinoid embryos from cell aggregates in cell culture.
- HANSEN - systematics and biology of elapod holothurians.
- HIMMELMAN - ecology of Strongylocentrotus droebachiensis.
- HOTCHKISS - asteroids of the International Indian Ocean Expedition.
- JANGOUX - structure, function and evolution of the digestive system of asteroids; annual reproductive cycle of some echinoids and asteroids; echinoderm fauna of Seychelles (Indian Ocean).
- KAO - physiology of asteroids
- KELLER - factors regulating abundance and distribution of regular echinoids in Discovery Bay, Jamaica.
- KIER - Triassic echinoids; Caribbean echinoids; evolution of post-Paleozoic echinoids; revision of Lambert and Thiery.
- KOBAYASHI - marine pollution bioassay by sea urchin eggs; histochemistry of oogenesis of sea urchins; physiology of reproduction of sea urchins.
- KOMATSU - development of sea-stars (Certanardoa semiregularis, Acanthaster planci, Astropecten scoparius, A. latespinosus and others); analysis of wrinkled blastula formation in Asteroidea.
- KYTE - ecology of Gorgonocephalus articus at Eastport, Maine: shallow water Panamanian ophiuroids; northeastern Pacific ophiuroids - ecology and systematics (with CAREY); systematics of deep-water ophiuroids from Central and South American west coast.
- LARRAIN - Recent and fossil echinoids of Chile.

RUBINOFF - aggregation, social behavior and communication in the sea urchin Diadema.

RUTHERFORD - genetic variation in sea cucumbers using electrophoresis.

SASTRY - biology of Stomopneustes variolaris.

SERAFY - echinoids of Gulf of Mexico; revision of genus Homolampas; zoogeography of North Atlantic echinoids; echinoids of New England region.

SHEPHERD - competitive interactions between echinoids and abalone.

SPENCER - population studies on Maine (U.S.A.) marine invertebrates.

STRATHMANN - functional limitations inherent in the ciliary feeding mechanism of echinoderm larvae. Reproductive strategies, life histories and dispersal of echinoderms.

TURNER - feeding biology of Luidia clathrata, and associations with brachyuran crabs; post-metamorphic growth of Ophiophragmus; zoogeography and population genetics of the asteroid Ctenodiscus; nutrition of the coelomic brooding holothurian Synaptula hydriformis.

VLOEBERGH - pollution studies - incorporation of heavy metals in Mytilidae (Mollusca) and Asteriidae; reproductive cycles of Asterias rubens in different waters.

WAHLMAN - cystoids and crinoids from Niagran reefs in northern Indiana and Ohio; paleoecology and functional morphology, particularly of Holocystites greenvillensis.

WEBER (J.N.) - temperature dependence of 18° content in echinoderm-deposited carbonates.

WEBER (W.) - color change of sea urchins (electron microscopy).

Some Recent Publications and Papers in Press

This list is based on contributions from specialists and on reprints received by us. Of course it is by no means complete. Please note that many of the papers listed below as "in press" will have already been published.

ALLEN, K., 1972. See DEARBORN, J. H.

ARENDET, Y. A., 1973. "Living fossil" Cyathidium foresti. Moskovskoe obshchestvo ispytatelei privody. Bulletin. Otdel geologicheskii 43 (3): 158-159.

ARNAUD, P. M., 1972. Mission du Bathyscaphe "Archimède" aux Azores, 1969. Observations faites au cours des plongées 3 et 4. In: Bathyscaphe "Archimède"; campagne 1966 à Madère, campagne 1969 aux Azores. Publ. C.N.E.X.O., Paris (Ser. Res. Campagnes à la Mer) 3.

_____, 1973. Contribution à la bionomie benthique antarctique et subantarctique. Thèse Doctorat d'Etat Fac. Sci. Marseille: 1-323 (Microfilm A.O. 7819) C.N.R.S. Centre de Documentation, 15 quai Anatole France, Paris.

_____, 1972. See DEARBORN, J. H.

ATWOOD, D. G., 1973. Histological comparison of asteroid neurosecretory granules before during and after natural spawning. Transactions of the American Microscopical Society 92 (2): 277-280.

_____, 1973. Larval development in the asteroid Echinaster echinophorus. Biological Bulletin 144 (1): 1-11.

_____, 1973. Correlation of gamete shedding with presence of neurosecretory granules in asteroids (Echinodermata). General and Comparative Endocrinology.

_____, In press. Ultrastructure of the gonadal wall of the sea cucumber Leptosynapta clarki (Echinodermata: Holothuroidea).

BELL, B. M., In press. A study of the North American Edrioasteroidea. New York State Museum Memoir 21.

BELYAEV, G. M. and N. M. LITVINOVA, 1972. New genera and species of deep-sea Ophiuroidea. Mosovskoe obshchestvo ispytatelei provody. Bulletin. Otdel Biologicheskii, vol. 73 (3): 5-20.

BERGER, J., 1972. See LYNN, D. H.

BERNASCONI, I., 1971. Echinodermata. Marion and Prince Edwards Islands. Report on the South African Biological and Geological Exp. 1965-1966. pp. 284-287, Cape Town.

_____, 1973. Argentinian Asteroidea. VI. Family Asterinidae. Hidrobiologia, Tome III, no. 4, pp. 335-346, pls. 1 and 2.

_____, 1973. Los Equinodermos colectados por el "Walther Herwig" en el Atlantico Sudoeste. Rev. Mus. Arg. Cs. Nat., Hidrobiologia, vol. III, no. 3, pp. 287-334, pls. 1-7.

_____ and M. M. D'AGOSTINO, 1973. The genus Ophiomastus Lyman, 1878 with description of an abyssal species O. molinae, 1968 (Ophiuroidea, Ophiuridae). Physis, Secc. A. Buenos Aires, vol. 32, no. 84: 197-202.

BINYON, J., 1972. Physiology of Echinoderms. Pergaman Press. 264 pp.

BLAKE, D. B., 1973. Ossicle morphology of some Recent asteroids and description of some West American Fossil asteroids. University of California Publications in Geological Sciences, vol. 104, pp. 1-59.

BOCKELIE, J. K., In press. The presence of Prunocystites (Cystoidea) in Stage 9e of Ringerlike. Norsk Geologisk Tidsskrift.

BRANHAM, J. M., 1973. The Crown of Thorns on Coral Reefs. BioScience, vol. 23, no. 4, pp. 219-226.

BREIMER, A. and D. B. MACURDA, JR., 1973. Paleozoic Blastoids. Atlas of Palaeobiogeography (A. Hallam, editor) Elsevier Scientific Publishing Company, pp. 207-212.

BULLE, J., In press. See ROMAN, J.

CAMP. D. K., S. P. COBB, and J. F. VAN BREEDVELD, 1973. Overgrazing of seagrasses by a regular urchin, Lytechinus variegatus. BioScience, vol. 23, no. 1, pp. 37-38.

CAMPBELL, A. C., 1972. The form and function of the skeleton in pedicellariae from Echinus esculentus L. Tissue & Cell, vol. 4, no. 4, pp. 647-661.

- CAREY, A. G., JR., 1972. Food sources of sublittoral, bathyal and abyssal asteroids in the northeast Pacific Ocean. *Ophelia* 10: 35-47.
- CASTILLA, J. C., 1971. Responses to light of Asterias rubens L. Fourth European Marine Biology Symposium, D. J. Crisp editor, Cambridge University Press, pp. 495-511.
- _____, 1972. Avoidance behaviour of Asterias rubens to extracts of Mytilus edulis, solutions of bacteriological peptone, and selected amino acids. *Marine Biology*, vol. 15, pp. 236-245.
- _____, 1972. Responses of Asterias rubens to bivalve prey in a Y-maze. *Marine Biology*, vol. 12, no. 3, pp. 222-228.
- CHANG, C. W. J., 1973. Marine natural products. Pigments. *Journal of Chemical Ed.* 50 (2): 102-106.
- _____, 1973. Marine natural products other than pigments. *Ibid.*, 50 (4): 260-262.
- CHAUVEL, J. and J. LE MENN, 1973. Echinodermes de l'Ordovicien Supérieur de Coat-Carrec, Argol (Finistère). *Soc. Geol. Mineral. de Bretagne*, ser. C, vol. 4, no. 1, pp. 39-61.
- CHIA, F.-S., 1973. Sand dollar: a weight belt for the juvenile *Science* 181: 73-74.
- CHERBONNIER, G., 1972. Neocnus incubans, nouveau genre et nouvelle espèce d'Holothurie dendrochirote incubatrice de Méditerranée. *C.R. Acad. Sc. Paris*, t. 275, pp. 225-227.
- _____, 1972. Thyone bacescoi nouvelle espèce d'Holothurie dendrochirote (Echinoderme) des côtes de Mauritanie. *Bull. Mus. Nat. Hist. Nat.*, ser. III, no. 30, pp. 291-294.
- _____, 1972. Amphiophus polymorphus n. sp., nouvelle espèce d'Ophiure (Echinoderme) des côtes malgaches. *Bull. Mus. Nat. Hist. Nat.*, ser. III, no. 30, pp. 285-290.
- _____ and A. GUILLE, 1972. Redescription et position systématique de l'Ophiure Ophiosphaera insignis Brock (Echinoderme). *Bull. Mus. Nat. Hist. Nat.*, ser. III, no. 30, pp. 279-282.
- _____, 1972. Sur une espèce actuelle de Crinoïde crétacique de la famille Holopodidae: Cyathidium foresti nov. sp. *C. R. Acad. Sc. Paris*, t. 274, pp. 2193-2196.

- CHESHER, R. H., 1972. The status of knowledge of Panamanian echinoids, 1971, with comments on other echinoderms. Bull. Biol. Soc. Wash., no. 2, pp. 139-158.
- CLARK, A. M., 1972. Some crinoids from the Indian Ocean. Bull. Brit. Mus. (Nat. Hist.), Zoology, vol. 24, no. 2, pp. 75-156.
- _____, 1973. Fossil and Recent comatulid crinoids with coelomic extensions penetrating the centrodorsal. Bull. Br. Mus. nat. Hist. (Zool.) 24, 9, pp. 441-446.
- _____, 1973. Some new taxa of Recent stalked Crinoidea. Bulletin of the British Museum (Nat. Hist.) Zoology, vol. 25, no. 7, pp. 265-288.
- COBB, S. P., 1973. See CAMP, D. K., et al.
- CORNET, D. and M. JANGOUX, In press. Arylsulfatases and B-glucuronidase activities in the digestive system of some echinoderms.
- _____, 1973. See JANGOUX, M., et al.
- D'AGOSTINO, M. M., 1973. See BERNASCONI, I.
- DEMBACH, M., 1972. See WEBER, W.
- DARTNALL, A. J., 1969. A new species of Marginaster (Asteroidea: Poraniidae) from Tasmania. Proceedings of the Linnean Society of New South Wales, vol. 94, part 3, pp. 207-211.
- DEARBORN, J. H., K. ALLEN, J. C. HUREAU and P. M. ARNAUD, 1972. Ecological and taxonomical studies of echinoderms, mollusks and fishes from the Antarctic Peninsula. Antarctic Journal of the U. S. 7 (4): 80-82.
- DEARBORN, J. H., 1972. See TURNER, R. L.
- DEVANEY, D. M., 1973. Zoogeography and faunal composition of south-eastern Polynesian asterozoan echinoderms, pp. 357-366. In Oceanography of the South Pacific 1972. New Zealand National Commission for UNESCO, Wellington.
- _____, 1973. Shallow water echinoderms from British Honduras with a description of a new species of Ophiocoma. Bulletin of Marine Science.
- _____, and J. RANDALL, 1973. Investigations of Acanthaster planci in southeastern Polynesia during 1970-1971. Atoll Research Bulletin.

- DIX, T. G., 1970. Biology of Evechinus chloroticus (Echinoidea: Echinometridae) from different localities. 3. Reproduction. New Zealand Journal of Marine and Freshwater Research, vol. 4, no. 4, pp. 385-405.
- _____, 1972. Biology of Evechinus chloroticus (Echinoidea: Echinometridae) from different localities. 4. Age, growth, and size. New Zealand Journal of Marine and Freshwater Research, vol. 6, no. 1 and 2, pp. 48-68.
- _____, 1972. See HILDEMANN, W. H.
- DOWNEY, M. E., 1973. Starfishes from the Caribbean and the Gulf of Mexico. Smithsonian Contributions to Zoology, no. 126, 158 pp., 48 pls.
- EBERT, T. A., 1973. Estimating growth and mortality rates from size data. Oecologia (Berl.) 11, pp. 281-298.
- ELLINGTON, W. R., 1973. Seasonal temperature characteristics of cytoplasmic malic dehydrogenase from the gut of the sand dollar, Mellita quinquiesperforata. Quart. J. Fla. Acad. Sci., vol. 36, no. 1, Supplement p. 10.
- _____, 1973. Malic and lactic dehydrogenase activities and ratios in regular and irregular echinoids (Echinodermata). Comp. Biochem. Physiol., vol. 45B, pp. 727-730.
- _____, and J. M. LAWRENCE, 1973. Seasonal temperature characteristics of supernatant malic dehydrogenase of adult and juvenile Mellita quinquiesperforata. Comparative Biochemistry and Physiology.
- _____, 1973. Coelomic fluid volume regulation and isosmotic intracellular regulation by Luidia clathrata (Echinodermata: Asteroidea) in response to hyposmotic stress. Biological Bulletin.
- ENGEL, H., 1972. Phymosoma masstrichtensis spec. nov., a Fossil echinoid from the Cretaceous of Masstricht (Echinacea, Phymosomatoida, Phymosomatidae). Zoologische Mededelingen, vol. 47, no. 44, pp. 540-544.
- FECHTER, H., 1973. Die stickstoffhaltigen Stoffwechselendprodukte und ihre Exkretion bei Paracentrotus lividus. Marine Biology 19, pp. 285-289.
- _____, 1973. Cyathidium meteorensis spec. nov., ein neuer Crinoide aus der Familie Holopodidae. Helgolander wiss. Meeresunters. 25, pp. 162-169.

FELL, H. B., 1972. See HOTCHKISS, F. H. C.

FENNAUX, L., 1972. Evolution saisonnière des gonades chez l'Ophiure Ophioderma longicauda (Retzius), Ophiuroidea. Int. Revue ges. Hydrobiol., vol. 57, no. 2, pp. 257-262.

_____, 1972. Contribution à la connaissance des larves de Spatangides en Méditerranée: Echinocardium mediterraneum (Forb.) et Spatangus purpureus (O.F.M.). Bulletin du Muséum National D'Histoire Naturelle, 3rd série, no. 31, pp. 297-304.

FENNER, D. H., 1973. The respiratory adaptations of the podia and ampullae of echinoids (Echinodermata). Biol. Bull., 145, pp. 323-339.

FERGUSON, J. C., In press. Growth and reproduction of Echinaster echinophorus.

FISHELSON, L., 1972. See KIDRON, J., et al.

GANAPATI, P. N. and D.R.K. SASTRY, 1970. Record of Athanas indicus (Coutiere) (Decapoda: Alpheidae) associated with Stomopneustes varioloris (Lamarck) (Echinodermata: Echinoidea) from Visakhapatnam Coast. (Abstract). Symposium on Marine Intertidal Ecology. National Institute of Science of India.

GLYNN, P. W., 1972. Observations on the ecology of the Caribbean and Pacific Coasts of Panama. Bull. Biol. Soc. Wash., no. 2, pp. 13-30.

_____, 1973. Acanthaster: Effect on coral reef growth in Panama. Science, vol. 180, pp. 504-506.

_____, R. H. STEWART and J. E. MC COSKER, 1972. Pacific Coral reefs of Panama: Structure, distribution and predators. Sonderdruck aus der Geologischen Rundschau Bd. 61, pp. 483-519.

GONOR, J. J., 1972. Gonad growth in the sea urchin Strongylocentrotus purpuratus (Stimpson) (Echinodermata: Echinoidea) and the assumptions of gonad index methods. Journal of Experimental marine Biology and Ecology 10: 89-103.

_____, 1973. Reproductive cycles in Oregon populations of the echinoid, Strongylocentrotus purpuratus (Stimpson). I. Annual gonad growth and ovarian gametogenic cycles. J. exp. mar. Biol. Ecol., vol. 12, pp. 45-64.

_____, 1973. Reproductive cycles in Oregon populations of the echinoid, Strongylocentrotus purpuratus (Stimpson). II. Seasonal changes in oocyte growth and in abundance of gametogenic stages in the ovary. J. exp. mar. Biol. Ecol., vol. 12, pp. 65-78.

- _____, 1973. Sex ratio and hermaphroditism in Oregon intertidal populations of the echinoid Strongylocentrotus purpuratus. Marine Biology 19, pp. 278-280.
- GORNY, P., 1973. See MÄRKEL, K.
- GUILLE, A., 1972. See CHERBONNIER, G.
- _____, 1972. See CHERBONNIER, G.
- GULLIKSEN, B. and S. H. SKJAEVELAND, 1973. The sea-star, Asterias rubens L., as predator on the ascidian Cliona intestinalis (L.), in Borgenfjorden, North-Trondelag, Norway. Sarsia 52: 15-20.
- HANSEN, B., 1972. Photographic evidence of a unique type of walking in deep-sea holothurians. Deep-Sea Research, vol. 19, pp. 461-2.
- HAUGH, B. N., 1972. Water vascular system of the Crinoidea Camerata. Journal of Paleontology, vol. 47, no. 1, pp. 77-90.
- HAYASHI, R., 1971. See KOMATSU, M.
- HIGGINS, R. C., 1972. Comparative efficiencies of the Smith-McIntyre and Baird grabs in collecting Echinocardium cordatum (Pennant) (Echinoidea: Spatangoida) from a muddy substrate. NZOI Records, New Zealand Oceanographic Institute, Wellington, New Zealand, vol. 1, no. 8, pp. 135-140.
- HILDEMANN, W. H. and T. G. DIX, 1972. Transplantation reactions of tropical Australian echinoderms. Transplantation 15 (2): 624-633.
- HOTCHKISS, F. H. C., 1973. [Review of] Binyon, John. Physiology of Echinoderms. American Scientist, vol. 61, no. 5, p. 589.
- _____, and H. B. FELL, 1972. Zoogeographical implications of a Paleogene echinoid from East Antarctica. Journal of the Royal Society of New Zealand, vol. 2, no. 3, pp. 369-372.
- HUMPHREYS, W. F. and J. LÜTZEN, 1972. Studies on parasitic gastropods from echinoderms. I. On the structure and biology of the parasitic gastropod Megadenus cantharelloides n. sp., with comparisons on Paramegadenus n. g. Det Kongelige Danske Videnskabernes Selskab Biologiske Skrifter 19, no. 1, 26 pp., 4 pls.
- HUREAU, J. C., 1972. See DEARBORN, J. H., et al.
- HYNDA, V. A., 1969. On the Crinoidea and Asteroidea from Upper Cretaceous deposits of the Volhynian-Podal Platform. Paleontologicheskii Sbornik No. 6, pp. 52-54.

- JANGOUX, M., 1972. Note anatomique sur Archaster angularis Muller et Troschel. Rev. Zool. Bot. Afr. 86: 163-172.
- _____, 1972. La structure fine des caecums rectoux de deux Asteroidea Marthasterias glacialis (L.) et Coscinasterias tenuispina (Lam.). Z. Zellforsch. 128: 366-384.
- _____, 1973. Les Asteries de l'Ile d'Inhaca (Mozambique) (Echinodermata, Asteroidea). I. Les especes recolrees et leur repartition geographique. Koninklijk Museum voor Midden-Africa-Tervuren, Belgique. Annalen-Reeks in 8°-Zool. Wetenschappen-no. 208, pp. 1-50.
- _____ and C. PERPEET, 1972. Etude comparative de la structure fine des caecums pyloriques de trois especes d'Asteroidea. Cahiers Biol. mar. 13: 401-420.
- _____, 1972. Etude histochemique de l'effet du jeûne sur les organes digestifs de l'etoile Asterias rubens L. Comptes Rendus Acad. Sci. Paris 274: 2587-2589.
- _____, 1973. See PERPEET, C.
- _____, C. PERPEET, and D. CORNET, 1973. Contribution à l'etude des poches stomacales d'Asterias rubens. Marine Biology 15: 329-335.
- _____ and M. VLOEBERGH, In press. Contribution a l'etude du cycle annuel de reproduction d'une population d'Asterias rubens L. du littoral belge. I. Observations histologiques.
- _____, In press. Ibid. II. Mesures physiques.
- _____, In press. See CORNET, D.
- JEFFERIES, R. P. S., 1973. The Ordovician fossil Lagynocystis pyramidalis (Barrande) and the ancestry of amphioxus. B. Biol. Sci, vol. 265, no. 871, pp. 409-469.
- _____ and R. J. PROKOP, 1972. A new calcichordate from the Ordovician of Bohemia and its anatomy, adaptations and relationships. Biol. Journal of the Linnean Society, vol. 4, no. 2, pp. 69-115.
- KALABIS, V., 1961. Über die "Art" Clypeaster partschi Michelin, 1861 aus dem miozän von Slatinky bei Prostějov in Mähren. Sbornik Vlastivědného Muzea v Prostějově, pp. 76-84.
- KIDRON, J., L. FISHELSON and B. MOAV, 1972. Cytology of an unusual case of hermaphroditic gonads in the tropical sea urchin Tripneustes gratila from Eilat (Red Sea). Marine Biology, vol. 14, no. 3, pp. 260-263.

- KIER, P. M., 1973. A new Silurian echinoid genus from Scotland. Reprinted from *Palaeontology*, vol. 16, part 4, pp. 651-663.
- _____, 1973. The echinoderms and Permian-Triassic Time. The Permian and Triassic Systems and Their Mutual Boundary, pp. 622-629.
- KOBAYASHI, N., 1973. Studies on the effects of some agents on fertilized sea urchin eggs, as a part of the bases for marine pollution bioassay. I. Publications of the Seto Marine Biological Laboratory 21 (2).
- KOLATA, D. R., 1973. Scaleonocystites strimplei, a new Middle Ordovician belemnocystitid solute from Minnesota. Reprinted from *Journal of Paleontology*, vol. 47, no. 5, pp. 969-974.
- KOMATSU, M., 1972. On the wrinkled blastula of the sea-star Asterina pectinifera. *Zoological magazine Tokyo* 81: 227-231.
- _____, and R. HAYASHI, 1971. On the development of the sea-star, Certionardoa semiregularis. I. *Proceedings of the Japanese Society of Systematic Zoology* 7: 74-80.
- _____, 1972. See OGURO, C.
- KRISHNAN, S., 1971. Autoradiographic studies on the sugar transport in the sea cucumber H. scabra. *Marine Biology* 10: 189-191.
- LARRAIN, A. P., 1973. Los pedicelarios globiferos y el desarrollo de Abatus agassizi (Pfeffer) (Echinodermata, Hemiasteridae). *Boletin Soc. Biol. Concepcion*, 46.
- LAWRENCE, J. M., 1973. Level, content, and caloric equivalents of the lipid, carbohydrate, and protein in the body components of Luidia clathrata (Echinodermata: Asteroidea: Platyasterida) in Tampa Bay. *J. exp. mar. Biol. Ecol.*, vol. 11, pp. 263-274.
- _____, 1973. See ELLINGTON, W. R.
- _____, 1973. See ELLINGTON, W. R.
- LE MENN, J., 1973. See CHAUVEL, J.
- LITVINOVA, N. M., 1972. See BELYAEV, G. M.
- LÜTZEN, J., 1972. Studies on parasitic gastropods from echinoderms. II. On Stilifer broderip, with special reference to the structure of the sexual apparatus and the reproduction. *Det Kongelige Danske Videnskaberiers Selskab Biologiske Skrifter* 19, 6, 18 pp., 1 pl.

- _____, 1972. Records of parasitic gastropods from crinoids, with description of a new genus, Goodingia (Gastropoda, Prosobranchia). Steenstrupia, Zoological Museum, University of Copenhagen, vol. 2, pp. 233-246.
- _____, 1972. See HUMPHREYS, W. F.
- LYNN, D. H. and J. BERGER, 1972. Morphology, systematics, and demic variation of Plagiopyliella pacifica Poljansky, 1951 (Ciliata: Philasterina), an entocommensal of stronglylocentrotid echinoids. Trans. Amer. micros. Soc., 91 (3): 310-336.
- MACURDA, D. B., JR., 1973. The stereomic microstructure of the blastoid endoskeleton. Contributions from the Museum of Paleontology, The University of Michigan vol. 24, no. 8, pp. 69-83.
- _____, 1973. See BREIMER, A.
- MÄRKEL, K., In press. Mikrosonden-Analysen am Zahnskelet von Seeigeln. Forschungsberichte NRW.
- _____ and P. GORNY, 1973. Zur funktionellen Anatomie der Seeigelzähne (Echinodermata, Echinoidea). Z. Morph. Tiere 75, pp. 223-242.
- MC CAULEY, J. E., 1972. See SUMICH, J. L.
- _____, 1973. See SUMICH, J. L.
- MC COSKER, J. E., 1972. See GLYNN, P. W., et al.
- MENGE, B. A., 1972. Foraging strategy of a starfish in relation to actual prey availability and environmental predictability. Ecological monographs 42: 25-50.
- _____, 1972. Competition for food between two intertidal starfish and its effect on body size and feeding. Ecology 53: 635-644.
- _____, 1973. Effect of predation and environmental patchiness on the body size of a tropical pulmonate limpet. The Veliger 16.
- _____, In press. Effect of wave action and competition on brooding and reproductive effort in the seastar Leptasterias hexactis. Ecology.
- MEYER, D. L., 1973. Feeding behavior and ecology of shallow-water unstalked crinoids (Echinodermata) in the Caribbean Sea. Marine Biology 22 (2): 105-129.

- MILEIKOVSKY, S. A., 1972. The "pelagic larvation" and its role in the biology of the world ocean, with special reference to pelagic larvae of marine bottom invertebrates. *Marine Biology* 16 (1): 13-21.
- MITROVIC, J. R., 1972. Importance du genre echinide Hemiaster pour les sediments de cretace Superieur en Serbie. *Bulletin du Mus. d'Hist. nat. Belgrade A* vol. 27.
- MOAV, B., 1972. See KIDRON, J., et al.
- MORRIS, R. W., H. B. ROLLINS and G. D. SHAAK, 1973. A new ophiuroid from the Brush Creek Shale (Conemaugh Group, Pennsylvanian) of Western Pennsylvania. *Jour. Paleo.*, vol. 47, no. 3, pp. 473-478.
- OGURO, C. and M. KOMATSU, 1972. Notes on the hemaphroditic specimen of the sea-star Certanardoa semiregularis. *Proceedings of the Japanese Society of Systematic Zoology* 8: 49-52.
- PAUL, C. R. C., 1972. Cheirocystella antiqua gen. et sp. nov. from the Lower Ordovician of Western Utah, and its bearing on the evolution of the Cheirocrinidae (Rhombifera: Glyptocystitida). *Brigham Young University Geology Series*, vol. 19, pt. 1, pp. 15-63.
- PERPEET, C. and M. JANGOUX, 1973. Contribution à l'etude des Pieds et des Ampoules Ambulacraires d'Asterias rubens (Echinodermata, Asteroidea). *Forma et functio*, vol. 6, pp. 191-209.
- _____, 1972. See JANGOUX, M.
- _____, 1972. See JANGOUX, M.
- _____, 1973. See JANGOUX, M., et al.
- PERREAU, M., In press. See ROMAN, J.
- PORTER, J. W., 1972. Predation by Acanthaster and its effect on coral species diversity. *The American Naturalist*, vol. 106, no. 950, pp. 487-492.
- PRIM, P., 1973. Utilization of marine polysaccharides by bacteria of the gut of the sea urchin, Lytechinus variegatus. *Quart. J. Fla. Acad. Sci.* vol. 36, no. 1, Supplement, p. 11.
- PROKOP, R. J., 1972. See JEFFERIES, R. P. S.
- _____, 1973. Codiacystis bohémica (Barrande, 1887) from the Ordovician of Libya (Cystoidea). *Casopis pro mineralogii a geologii*, roc. 18, pp. 73-74.

- _____, 1973. Elicrinus n. gen. from the Lower Devonian of Bohemia (Crinoidea). Vestnik Ustradniho ustavu geologickeho, 48, pp. 221-224.
- RANDALL, J., 1973. See DEVANEY, D. M.
- RAO, G. C., 1973. Occurrence of some juvenile stages referable to the apodous holothurian Patinapta ooplax (Marenzeller) in the intertidal sands of Andaman Islands. The Proceedings of the Indian Academy of Sciences, vol. LXXVII, sec. B, no. 6, pp. 225-233.
- REGIS, M.-B., 1969. Premières données sur la croissance de Paracentrotus lividus Lmk. Tethys vol. 1, no. 4, pp. 1049-1055.
- _____, 1972. Sur la croissance de Paracentrotus lividus Lmk. II. Le système apical. Tethys vol. 4, no. 2, pp. 481-492.
- _____, In press. Premières données sur la croissance d'Arbacia lixula (L.). Tethys.
- _____, In press. Sur la croissance d'Arbacia lixula (L.). II, le Système Apical.
- _____, In press. Sur les anomalies du système Apical de Paracentrotus lividus.
- ROBISON, R. A. and J. SPRINKLE, 1969. A new echinoderm from the Middle Cambrian of Utah. Abstract of a short paper presented at the Geol. Soc. of Amer., Rocky Mountain Section Annual Mtg., Salt Lake City, Utah.
- ROLLINS, H. B., 1973. See MORRIS, R. W., et al.
- ROMAN, J., In press. Etudes paléontologiques et géologiques sur les falaises de Fresco (Côte d'Ivoire). 6. Echinides. Ann. Fac. Sci. Univ. Dakar.
- _____, In press. Découverte du genre Brissopsis (Echinide, Spatangoides) dans les faluns du Miocène moyen de Bretagne (Le Quiou, Côtes-du-Nord). Implications biogéographique et écologiques. Comptes Rendus 97^e Congr. des Sociétés sav., Nantes 1972.
- _____, and J. BULLE, In press. Découverte de Trachypatagus hantkeni (Echinide, Spatangoides) dans le Paléogène de la Macédoine yougoslave. Ann. scient. Univ. Besançon.

- _____ and M. PERREAU, In press. Sur des echinodermes (Ophiurites sp., O. eocaenicus, Circopeltis aff couloni) du Bartonien du Val-d'Oise. Etude paleontologique et remarques taphonomiques.
- RUTHERFORD, J. C., In press. Reproduction, growth, and mortality of the holothurian Cucumaria pseudocurata Deichmann, 1938. Marine Biology.
- SASTRY, D. R. K., 1970. See GANAPATI, P. N.
- SCHROEDER, R., 1972. Nota preliminar sobre los Carpordeos del Cambrico medio de Asturias y Leon. Breviora geol. asturica 16 (2): 17-22.
- _____, 1973. Carpoideen aus dem Mittelkambrium Nordspaniens. Palaeontographica A 141: 119-142.
- SEMENENKO, V. N., 1965. New species Prosodacna from the Low Cimmerian deposits of the northern part of the Sea of Azov Region. Paleontologicheskii Sbornik no. 2, pp. 117-118.
- SERAFY, D. K., 1971. A redescription of Clypeaster pallidus H. C. Clark 1915, and a description of juvenile C. rasoceus. Bulletin of Marine Science 21 (3): 779-786.
- _____, In press. Variation in the polytypic sea urchin Lytechinus variegatus (Lamarck, 1816) in the western Atlantic Bulletin of Marine Science.
- SHAAK, G. D., 1973. See MORRIS, R. W., et al.
- SKJAEVELAND, S. H., 1973. Ecology of echinoderms in Borgenfjorden, North-Trøndelag, Norway. Det. Kgl. Norske Videnskabers Selskab museet. Miscellanea 8: 1-51.
- _____, 1973. See GULLIKSEN, B.
- SPRINKLE, J., 1969. See ROBISON, R. A.
- _____, 1972. Evolution of Hybocrinid crinoids. Abstract. Echinoderms Conference, Smithsonian Institution, Wash., D.C.
- STANCYK, S. E., In press. Development of Ophiolepis elegans (Echinodermata: Ophiuroidea) and its implications in the estuarine environment. Marine Biology.
- STEWART, R. H., 1972. See GLYNN, P. W., et al.
- STRATHMANN, R., In press. Spread of sibling larvae of sedentary marine invertebrates.

- SUMICH, J. L. and J. E. MC CAULEY, 1972. Calcium-Magnesium ratios in the test plates of Allocentrotus fragilis. Marine Chemistry 1: 55-59.
- _____, 1973. Growth of a sea urchin, Allocentrotus fragilis, off the Oregon coast. Pacific Science vol. 27, no. 2, pp. 156-167.
- TORTONESE, E., 1972. L'Echinofauna del Piano Batiale nel Golfo di Genova. Doriana, vol. V, no. 204, pp. 1-7.
- TURNER, R. L. and J. H. DEARBORN, 1972. Skeletal morphology of the mud star, Ctenodiscus crispatus (Echinodermata: Asteroidea). Journal of Morphology, vol. 138, no. 2, pp. 239-262.
- VAN BREEDVELD, J. F., 1973. See CAMP, D. K., et al.
- VLOEBERGH, M., In press. See JANGOUX, M.
- _____, In press. See JANGOUX, M.
- WARN, J. M., 1973. The Ordovician crinoid Heterocrinus, with reference to brachial variability in H. tenuis. Journal of Paleontology vol. 47, no. 1, pp. 10-18.
- WEBER, J. N., In press. Temperature dependence of magnesium in echinoid and asteroid skeletal calcite: a reinterpretation of its significance.
- _____, and M. DAMBACH, 1972. Amoboid bewegliche pigmentzellen im Epithel des Seeigels Centrostephanus longispinus. Z. Zellforsch. 133, pp. 87-102.

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